US009410840B2

(12) **United States Patent**
Acheson et al.

(10) **Patent No.: US 9,410,840 B2**
(45) **Date of Patent: *Aug. 9, 2016**

(54) **MULTI-VARIABLE YIELD MONITOR AND METHODS FOR THE SAME**

(71) Applicant: **Raven Industries, Inc.**, Sioux Falls, SD (US)

(72) Inventors: **John Earl Acheson**, Sioux Falls, SD (US); **Stephen Filip Fjelstad**, Worthing, SD (US); **Douglas Samuel Prairie**, Sioux Falls, SD (US)

(73) Assignee: **Raven Industries, Inc.**, Sioux Falls, SD (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 256 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/835,054**

(22) Filed: **Mar. 15, 2013**

(65) **Prior Publication Data**

US 2014/0262547 A1 Sep. 18, 2014

(51) **Int. Cl.**
A01D 41/127 (2006.01)
G01F 13/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G01G 11/003*** (2013.01); ***G01G 11/04*** (2013.01); ***G01G 19/12*** (2013.01); ***G01G 21/23*** (2013.01); *A01D 41/1271* (2013.01); *A01D 41/1272* (2013.01); *G01F 13/003* (2013.01)

(58) **Field of Classification Search**
CPC A01D 41/00; A01D 41/02; A01D 41/127; A01D 41/14; A01D 41/1271; G01B 11/28; G01B 21/12; G01G 11/00; G01G 11/14; G01G 19/08; G01G 19/14; G01G 11/04; G01G 19/12; G01G 21/23; G01G 11/003; G01F 13/003
See application file for complete search history.

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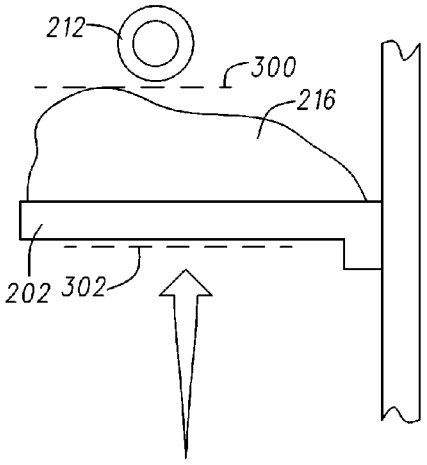
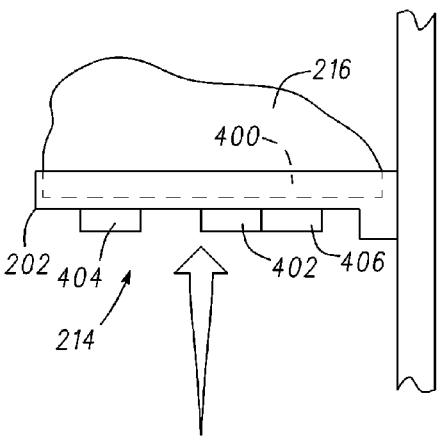
Primary Examiner — Randy W Gibson
(74) *Attorney, Agent, or Firm* — Schwegman Lundberg & Woessner, P.A.

(57) **ABSTRACT**

A dynamic yield monitor system includes a plurality of instruments to measure harvested crop characteristics while a crop is in-flow within a harvester elevator. The system includes a volume instrument that measures a harvested crop volume from the in-flow harvested crop within the harvester elevator, and a weight instrument that measures a harvested crop weight from the in-flow harvested crop within the harvester elevator. Optionally, the system includes other instruments including a moisture and temperature instrument. A receiver and processing node communicates with the instrument. The receiver and processing determines variable harvested crop test weight based on at least the measured harvested crop volume and measured harvested crop weight of the in-flow crop. The receiver and processing node further determines a variable yield of the harvested crop based on the measured harvested crop volume, the measured harvested crop weight, and the variable harvested crop test weight.

23 Claims, 8 Drawing Sheets





(51) **Int. Cl.**

G01G 11/04	(2006.01)
G01G 19/12	(2006.01)
G01G 21/23	(2006.01)
G01G 11/00	(2006.01)

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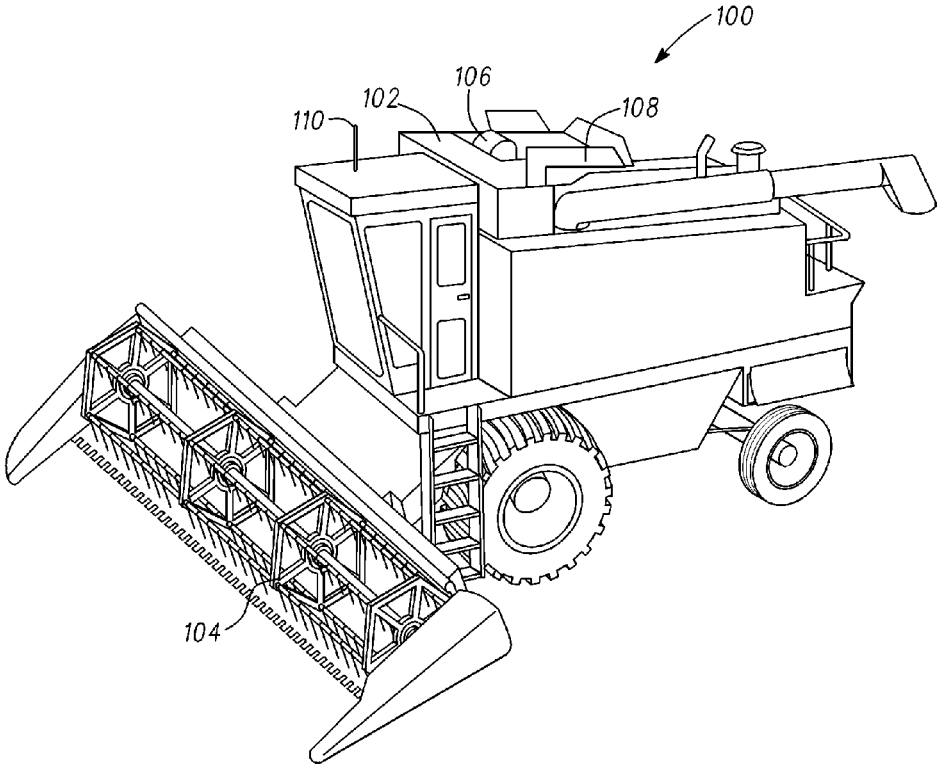
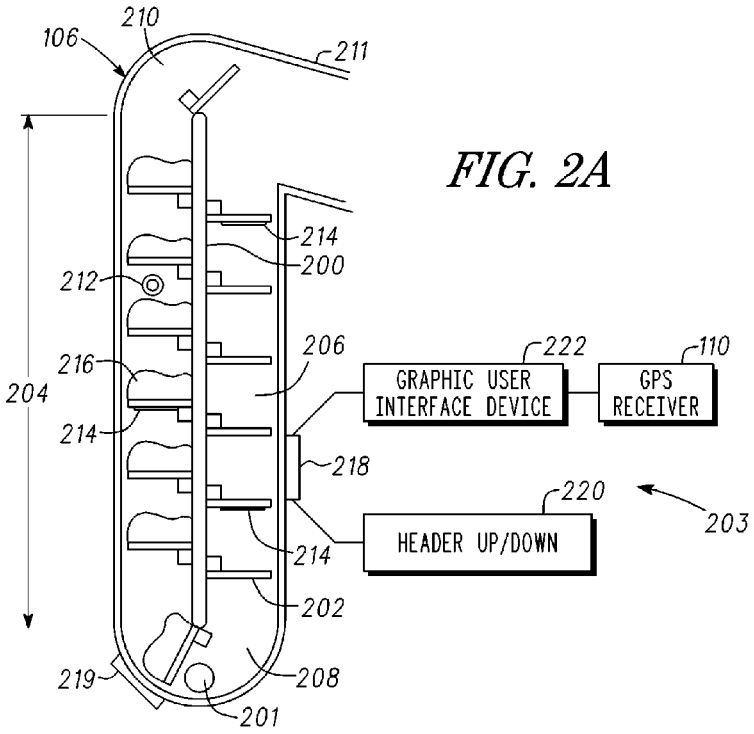


FIG. 1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210
211
214
200
212
206
222
110
216
GRAPHIC USER INTERFACE DEVICE
GPS RECEIVER
204
214
218
220
203
HEADER UP/DOWN
214
202
219
208
201

FIG. 2A

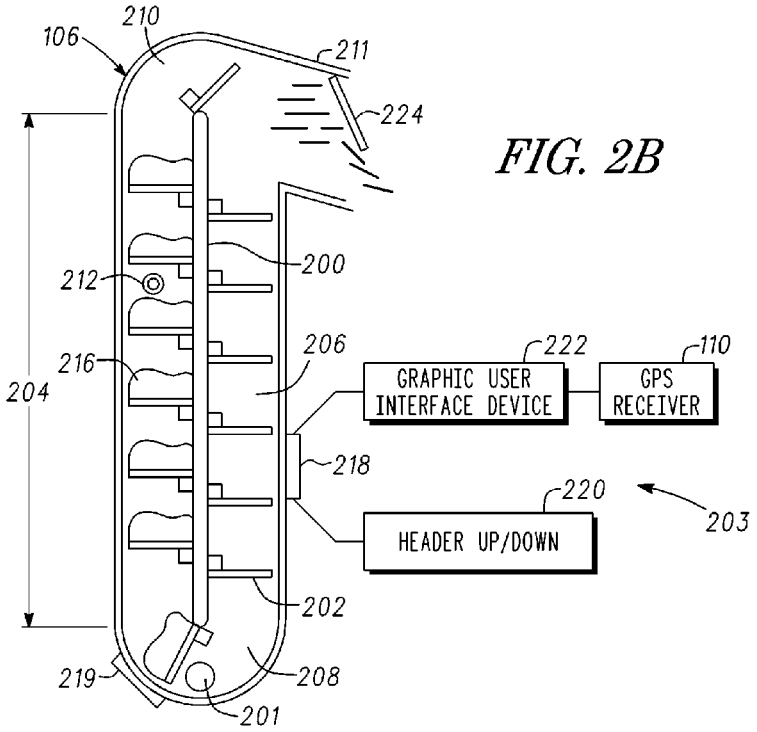
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FIG. 2B

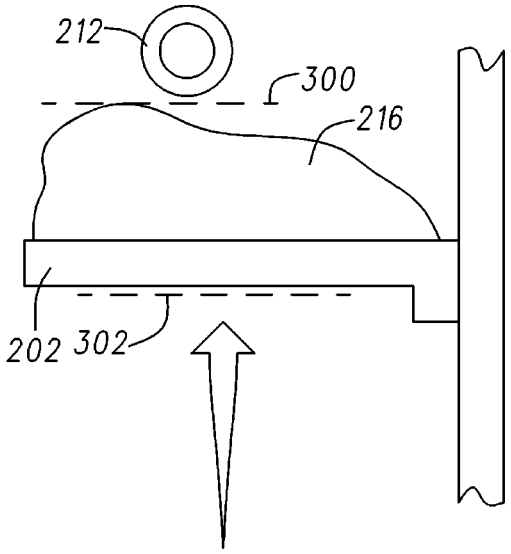

FIG. 3

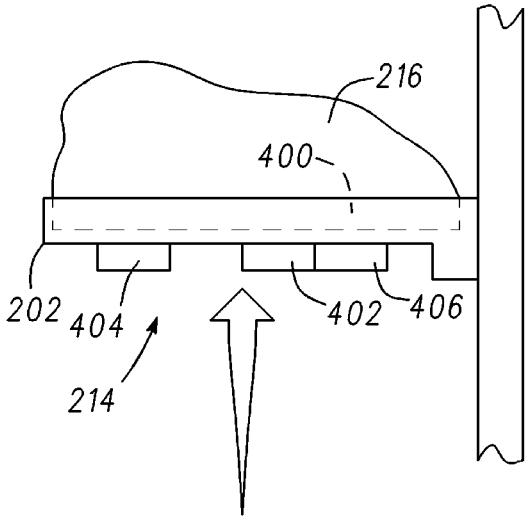

FIG. 4

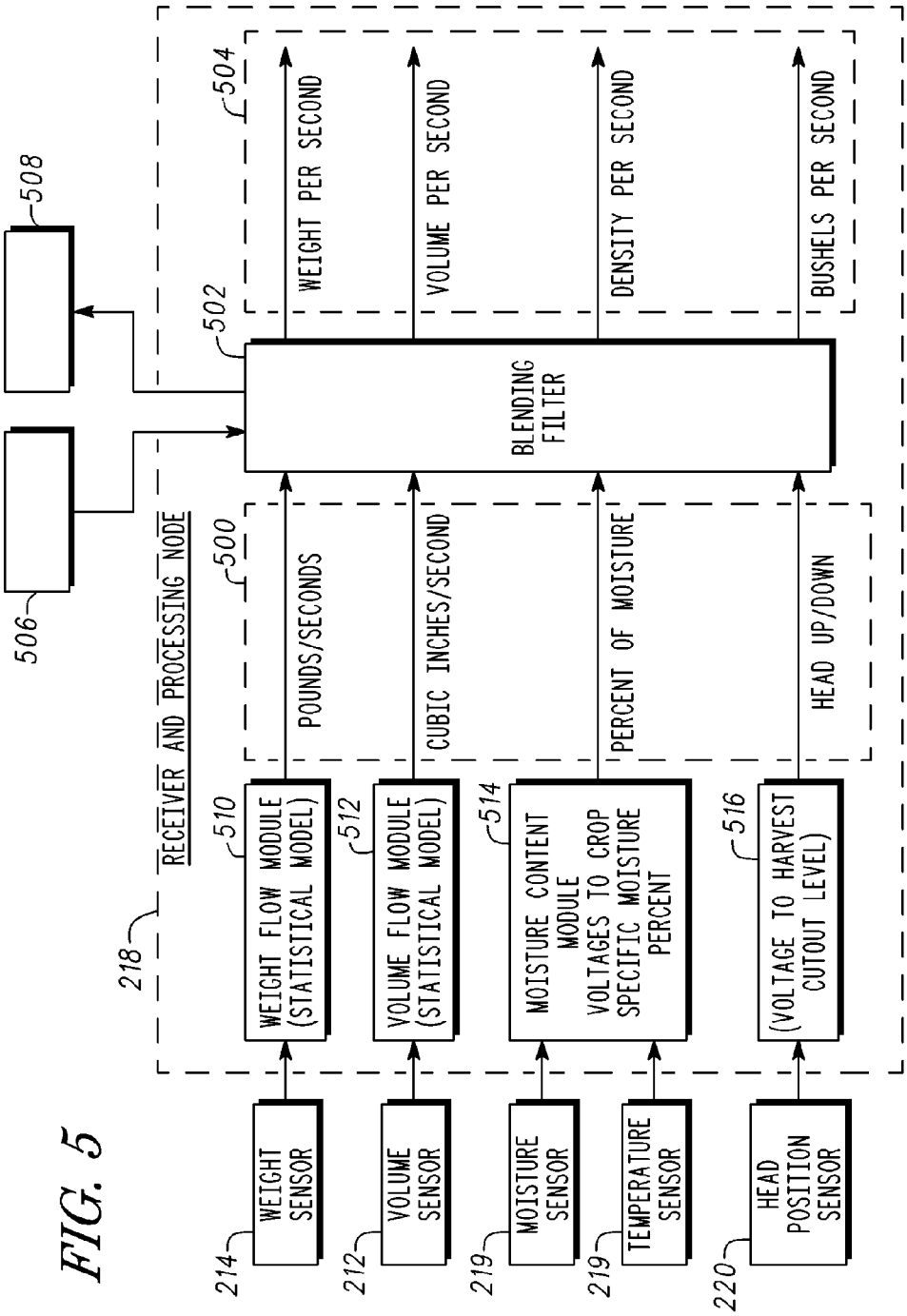
508
506
504
502
WEIGHT PER SECOND
VOLUME PER SECOND
DENSITY PER SECOND
BUSHELS PER SECOND
BLENDING FILTER
RECEIVER AND PROCESSING NODE
500
POUNDS/SECONDS
CUBIC INCHES/SECOND
PERCENT OF MOISTURE
HEAD UP/DOWN
218
510
WEIGHT FLOW MODULE (STATISTICAL MODEL)
512
VOLUME FLOW MODULE (STATISTICAL MODEL)
514
MOISTURE CONTENT MODULE VOLTAGES TO CROP SPECIFIC MOISTURE PERCENT
516
(VOLTAGE TO HARVEST CUTOUT LEVEL)
214
WEIGHT SENSOR
212
VOLUME SENSOR
219
MOISTURE SENSOR
219
TEMPERATURE SENSOR
220
HEAD POSITION SENSOR

FIG. 5

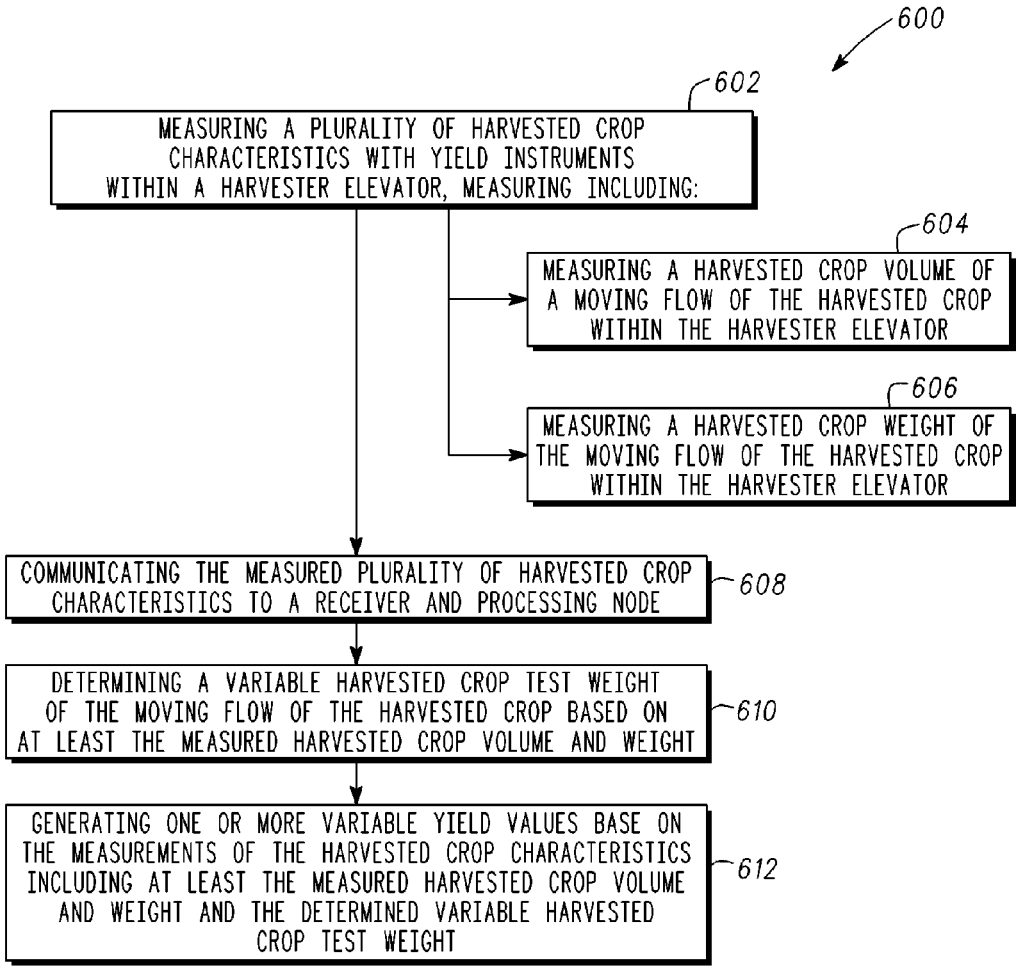
600
602
MEASURING A PLURALITY OF HARVESTED CROP CHARACTERISTICS WITH YIELD INSTRUMENTS WITHIN A HARVESTER ELEVATOR, MEASURING INCLUDING:
604
MEASURING A HARVESTED CROP VOLUME OF A MOVING FLOW OF THE HARVESTED CROP WITHIN THE HARVESTER ELEVATOR
606
MEASURING A HARVESTED CROP WEIGHT OF THE MOVING FLOW OF THE HARVESTED CROP WITHIN THE HARVESTER ELEVATOR
COMMUNICATING THE MEASURED PLURALITY OF HARVESTED CROP CHARACTERISTICS TO A RECEIVER AND PROCESSING NODE
608
DETERMINING A VARIABLE HARVESTED CROP TEST WEIGHT OF THE MOVING FLOW OF THE HARVESTED CROP BASED ON AT LEAST THE MEASURED HARVESTED CROP VOLUME AND WEIGHT
610
GENERATING ONE OR MORE VARIABLE YIELD VALUES BASE ON THE MEASUREMENTS OF THE HARVESTED CROP CHARACTERISTICS INCLUDING AT LEAST THE MEASURED HARVESTED CROP VOLUME AND WEIGHT AND THE DETERMINED VARIABLE HARVESTED CROP TEST WEIGHT
612

FIG. 6

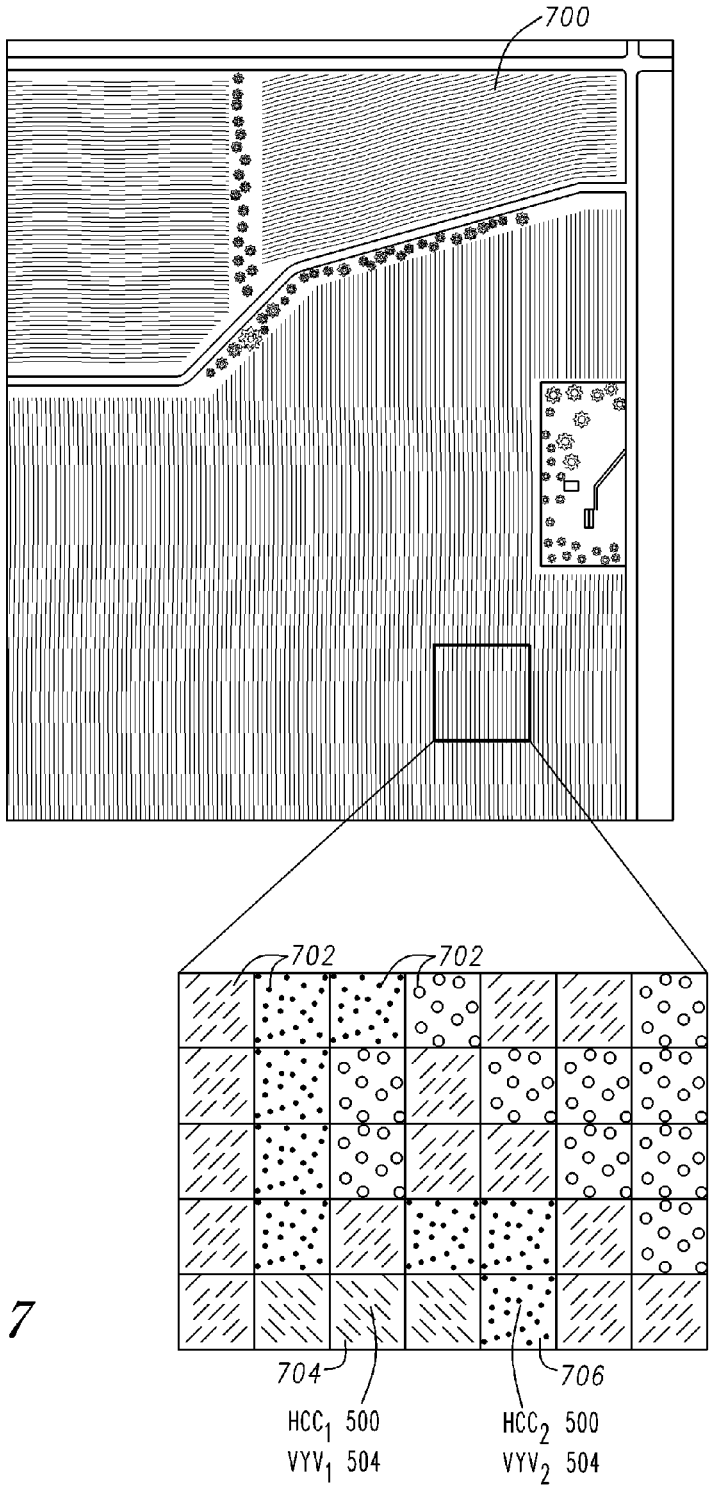

FIG. 7

FIG. 8

ZONE	VOLUME (IN^3/SEC)	WEIGHT (LBM/SEC)	TEST WEIGHT (IN^3/LBM*SEC): F(VOLUME, WEIGHT)	MOISTURE CONTENT (PERCENTAGE)	TEMPERATURE (DEGREES F)	BUSHELS (PER SEC)	BUSHELS TOTAL
Z_1	V_1	W_1	TW_1	MC_1	T_1	B_1	BT_1
Z_2	V_2	W_2	TW_2	MC_2	T_2	B_2	BT_2
Z_3	V_3	W_3	TW_3	MC_3	T_3	B_3	BT_3
Z_4	V_4	W_4	TW_4	MC_4	T_4	B_4	BT_4
Z_5	V_5	W_5	TW_5	MC_5	T_5	B_5	BT_5
Z_6	V_6	W_6	TW_6	MC_6	T_6	B_6	BT_6
Z_7	V_7	W_7	TW_7	MC_7	T_7	B_7	BT_7
Z_8	V_8	W_8	TW_8	MC_8	T_8	B_8	BT_8
Z_9	V_9	W_9	TW_9	MC_9	T_9	B_9	BT_9
Z_{10}	V_{10}	W_{10}	TW_{10}	MC_{10}	T_{10}	B_{10}	BT_{10}
Z_{n+10}	V_{n+10}	W_{n+10}	TW_{n+10}	MC_{n+10}	T_{n+10}	B_{n+10}	BT_{n+10}

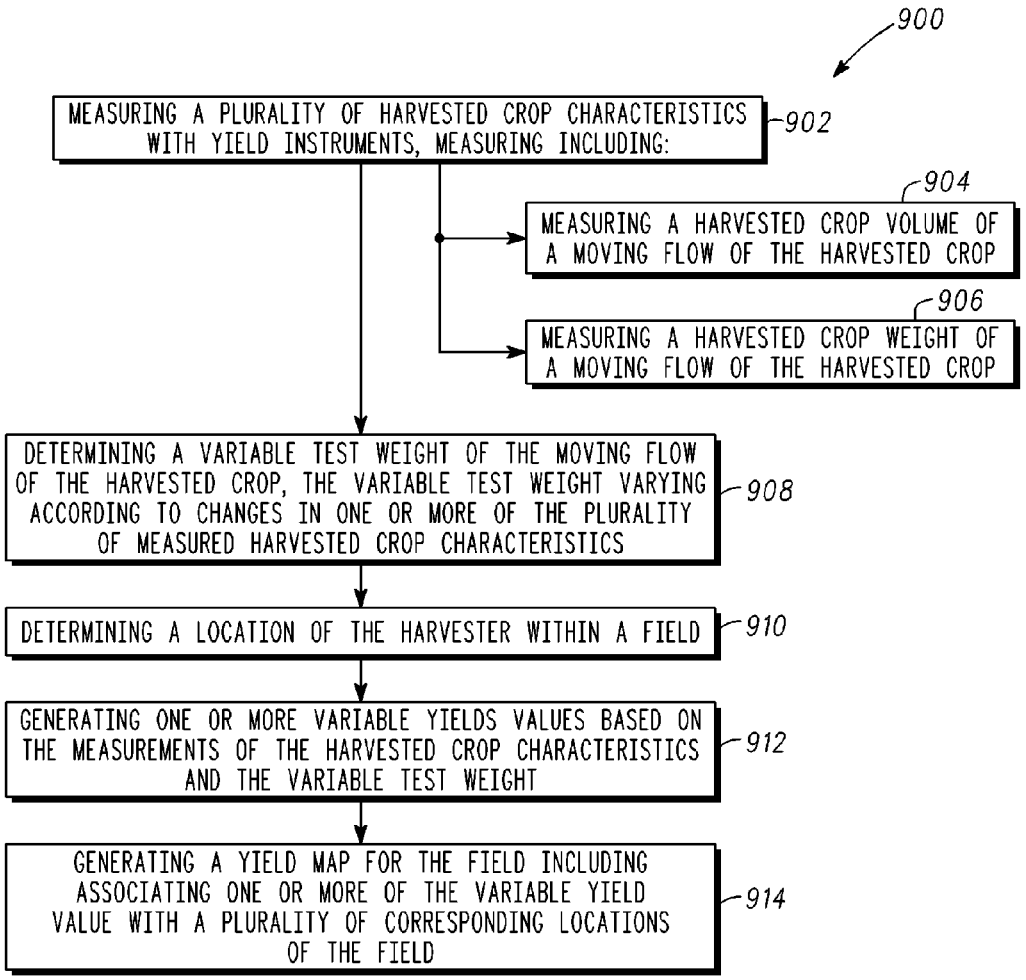
900
MEASURING A PLURALITY OF HARVESTED CROP CHARACTERISTICS WITH YIELD INSTRUMENTS, MEASURING INCLUDING:
902
MEASURING A HARVESTED CROP VOLUME OF A MOVING FLOW OF THE HARVESTED CROP
904
MEASURING A HARVESTED CROP WEIGHT OF A MOVING FLOW OF THE HARVESTED CROP
906
DETERMINING A VARIABLE TEST WEIGHT OF THE MOVING FLOW OF THE HARVESTED CROP, THE VARIABLE TEST WEIGHT VARYING ACCORDING TO CHANGES IN ONE OR MORE OF THE PLURALITY OF MEASURED HARVESTED CROP CHARACTERISTICS
908
DETERMINING A LOCATION OF THE HARVESTER WITHIN A FIELD
910
GENERATING ONE OR MORE VARIABLE YIELDS VALUES BASED ON THE MEASUREMENTS OF THE HARVESTED CROP CHARACTERISTICS AND THE VARIABLE TEST WEIGHT
912
GENERATING A YIELD MAP FOR THE FIELD INCLUDING ASSOCIATING ONE OR MORE OF THE VARIABLE YIELD VALUE WITH A PLURALITY OF CORRESPONDING LOCATIONS OF THE FIELD
914

FIG. 9

MULTI-VARIABLE YIELD MONITOR AND METHODS FOR THE SAME

CROSS-REFERENCE TO RELATED PATENT DOCUMENTS

This patent application is related to US patent application entitled "REMOTE MOISTURE SENSOR AND METHODS FOR THE SAME"; filed on an even date herewith, and incorporated herein by reference.

This patent application is also related to US patent application entitled "IN-FLOW WEIGHT SENSOR AND METHODS FOR THE SAME"; filed on an even date herewith, and incorporated herein by reference.

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TECHNICAL FIELD

This document pertains generally, but not by way of limitation, to systems and methods of determining crop yields.

BACKGROUND

Yield monitor systems are used to measure crop yields during harvesting. Yield characteristics, such as weight or volume, are used to assess the quality and quantity of a crop and accordingly determine its purchase price. In one example a yield equation that assesses the quality and quantity of a crop is based on four distinct variables and a fifth related variable. In one example, the four variables include volume, temperature, moisture and test weight (density) of the harvested crop. The fifth related variable is the weight of the harvested crop, and with at least some yield monitors the weight is determined according to the volume and test weight.

One example of a type of yield monitor is a volume based yield monitor. With volume based yield monitors a volume sensor is provided in a harvester elevator that measures the volume of a harvested crop within the elevator. The operator of the harvester inputs a test weight (density) assumption for the harvested crop in a field based on the observed field conditions, the crop being harvested, as well as the experience of the operator. The weight is derived from the volume measured and the assumed test weight.

Another example of a type of yield monitor is a weight based yield monitor that uses a weight sensor to measure the weight of a harvested crop. With weight based yield monitors the four variables include weight, temperature, moisture and the test weight of the harvested crop. In contrast to the volume based yield monitor, the weight based yield monitor determines the volume of the harvested crop according to the test weight and the weight. Similar to the volume based yield monitor, an operator of the weight based yield monitor assumes a test weight for a field and inputs the assumed test weight. As discussed above, the assumed test weight and the measured weight are used to determine the volume of the harvested crop.

Overview

The present inventors have recognized, among other things, that a problem to be solved can include the minimizing of error introduced by assumptions into yield values. In an example, the present subject matter can provide a solution to this problem, such as by a system or method that determines yield values based on measured harvested crop characteristics. Stated another way, operator assumptions of characteristics, such as a test weight value are entirely avoided.

In one example, the systems or methods described herein measure both volume and weight and the test weight for a harvested crop is determined based on these measured characteristics. Accordingly, the generation of one or more harvested crop yield values is based on measured (as opposed to one or more assumed) characteristic values including the test weight (determined by the measured characteristic values). Further still, each of the measured characteristics and the corresponding yield values vary dynamically according to the measurements of the instruments associated with a harvester elevator.

The present inventors have further recognized, that a problem to be solved can include increasing the resolution of harvested crop yield values within a field. As discussed above, in at least some yield monitors a test weight value is assumed for a particular field and input to the yield monitor for use in yield calculations. The corresponding yield calculations are thereby accordingly consistently based on the same assumed test weight value within the field even though in practice the test weight will vary within the field, sometimes widely.

In another example, the systems or methods described herein address this problem by dynamically measuring each of the one or more harvested crop characteristics including, but not limited to, harvested crop volume and weight. As discussed above, the test weight is determined from these measurements. Accordingly, the test weight dynamically varies according to actual measured characteristics for a harvested crop as it is harvested from various locations of the field. Because the test weight dynamically changes along with the measured harvested crop characteristics, the corresponding harvested crop yield values dynamically change according to the location of the harvester within the field. Yield maps generated with these dynamically changing values (measured characteristics and determined test weight) accordingly provide enhanced resolution relative to previous yield maps that use a consistent assumed test weight for the field. High resolution yield maps based on dynamic changes as opposed to consistent static assumptions decrease error in yield calculations, for instance to one percent or less. Further, high resolution yield maps are valuable to an operator as accurate yield values are indexed to specific locations in the field, thereby facilitating improved husbandry and planting in future seasons (e.g., varied hybrid planting within portions of the field, varied agricultural product application, watering and the like).

This overview is intended to provide an overview of subject matter of the present patent application. It is not intended to provide an exclusive or exhaustive explanation of the invention. The detailed description is included to provide further information about the present patent application.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are not necessarily drawn to scale, like numerals may describe similar components in different

views. Like numerals having different letter suffixes may represent different instances of similar components. The drawings illustrate generally, by way of example, but not by way of limitation, various embodiments discussed in the present document.

FIG. **1** is a perspective view of one example of a harvester.

FIG. **2**A is a schematic diagram of one example of a harvester elevator including a dynamic yield monitor system.

FIG. **2**B is a schematic diagram of a harvester elevator including another example of a dynamic yield monitor system.

FIG. **3** is a schematic diagram one example of a volume instrument.

FIG. **4** is a schematic diagram of one example of a paddle mounted weight instrument.

FIG. **5** is a block diagram showing one example of a yield monitor receiving and processing node.

FIG. **6** is a block diagram showing one example of a method for measuring one or more dynamic yield values for a harvested crop.

FIG. **7** is a top view of one example of an agricultural field during harvesting of a crop by a harvester including the dynamic yield monitor system of FIG. **2**.

FIG. **8** is an array of harvested crop characteristic measurements and yield values associated with corresponding locations of the field of FIG. **7**.

FIG. **9** is a block diagram showing one example of a method for generating a location based yield map.

DETAILED DESCRIPTION

FIG. **1** shows one example of a harvester, such as a harvester combine **100**. As shown the harvester **100** includes a body **102** and a header **104** movably coupled with the body **102**. In one example, the header **104** is used to cut and divide grain such as crops and deliver the grain into the body **102** for further processing. Referring again to FIG. **1**, in one example the harvester **100** includes a harvester elevator **106** configured to remove processed grain for instance from the internal mechanisms of the harvester **100** and deposit the grain within a grain tank **108**. As further shown in FIG. **1** an antenna, such as a GPS antenna **110**, is further provided on the body **102** to provide accurate position data of the harvester **100** for instance while harvesting within a field.

As previously described, the harvester **100** includes a harvester elevator **106** configured to deliver grain from processing into a grain tank **108**. As will be described herein, the harvester elevator **106** includes one or more instruments (e.g., a suite of instruments) as well as a receiver and processing node configured to measure one or more characteristics, such as harvested crop characteristics of a crop delivered through the harvest elevator **106** to the grain tank **108**. As will be further described herein, the dynamic yield monitor system provided herein is configured to use each of four representative harvested crop characteristics used in standard yield equations to determine one or more variable yield values of the crop at it is harvested from a field. The dynamic yield monitor system is configured to determine each of these crop characteristics in a dynamic fashion, for instance as the harvester **100** is harvesting the crop within a field. Accordingly, assumptions of particular crop characteristics, such as test weight (density) and one or more related characteristics, such as weight or volume are avoided. Stated another way, the dynamic yield monitor system described herein is able to dynamically determine each of the harvested crop characteristics and accurately determine one or more variable yield values without user inputted assumptions, for instance regarding test weight or the like.

Although the systems and methods described herein are shown in the context of an exemplary harvester **100**, the disclosure is not limited to harvesters **100**. Instead, the systems and methods are applicable to any system (whether static or moving) that would benefit from accurate crop characteristic measurements of an in-flow crop. For instance, the systems and methods described herein are used with, but not limited to, stationary harvesters, elevators, crop picking systems (e.g., fruit and apple picking systems) and the like.

Referring now to FIG. **2**A, one example of the harvester elevator **106** previously shown in FIG. **1** is provided. In the schematic view provided in FIG. **2**A an elevator loop **200** is shown extending through the harvester elevator **106**. The elevator loop **200** includes a plurality of paddles **202** arranged in a linear configuration that cyclically move within descending and ascending segments **206**, **204**. During the descending segment **206** the paddles **202** move without a harvested crop and engage with a harvested crop for instance at a trough segment **208**. The harvested crop is in one example supplied through a supply auger **201** and is immediately engaged by one or more of the paddles **202** as the paddles move through the trough segment **208**. The harvested crop (e.g., a quantity of harvested crop **216**) as shown in FIG. **2**A is elevated along an ascending segment **204** of the harvester elevator **106**. In one example, the quantity of harvested crop **216** on each of the paddles **202** is substantially static relative to the paddles **202** as it ascends. That is to say the paddle **202** and the quantity of harvested crop **216** on the respective paddle are substantially static relative to one another while the composite of the quantity of the harvested crop **216** and the paddle **202** are otherwise moving within the ascending segment **204** toward an apex segment **210**. The quantity of harvested crop **216** is elevated to the apex segment **210** as previously described and delivered through a crop chute **211** for instance to the grain tank **108**.

As further shown in FIG. **2**A, one example of a dynamic yield monitor system **203** is provided. In the example shown, the dynamic yield monitor system **203** includes one or more instruments or a plurality of instruments (e.g., a suite of instruments) configured to determine one or more harvested crop characteristics dynamically, for instance as the harvester **100** is harvesting the crop within a field and the harvested crop flows through the harvester elevator **106**. In the example shown the dynamic yield monitor system **203** includes a volume instrument **212** and a separate weight instrument **214**. In the example shown in FIG. **2**A the weight instrument **214** is associated with one or more of the paddles **202**. Stated another way, the weight instrument **214** is installed on one of the paddles **202** (and alternatively a plurality of paddles of the total number of paddles of the elevator loop **200**).

As further shown in the dynamic yield monitor system **203** example, the system further includes a moisture and temperature instrument **219** positioned for instance within a portion of the trough segment **208**. The moisture and temperature instrument **219** is configured to measure the moisture content as well as the temperature of the harvested grain as it enters the harvester elevator **106** for instance immediately before and during engagement and lifting by one or more of the paddles **202**. In still another example, the dynamic yield monitor system **203** includes a header orientation instrument **220**. The header orientation instrument **220** is coupled with the header, such as the header **104** shown in FIG. **1**. The header orientation instrument **220** is sized and shaped to determine the orientation of the header **104**, for instance while the header **104** is in a down position and accordingly

harvesting the crop in the field and while the header is in an up position where the header **104** is disengaged and accordingly no longer harvesting the crop. As will be described herein, in one example the header orientation instrument **220** is associated with the antenna **110** to accordingly index the location of the harvester **100** and the corresponding orientation of the header **104** (whether up or down) with that corresponding position.

As further shown in FIG. **2**A, in another example the dynamic yield monitor system **203** includes a receiver and processing node **218**. The receiver and processing node **218** in one example serves as the nexus or communal node for each of the instruments of the suite of instruments including for instance the volume instrument **212**, the weight instrument **214**, the moisture and temperature instrument **219** and the header orientation instrument **220**. In another example, the receiver and processing node **218** and the corresponding dynamic yield monitor system **203** include one or more of the instruments provided herein for the instrument suite. For instance, the dynamic yield monitor system **203** includes a volume instrument **212** in combination with the moisture and temperature instrument **219** and the header orientation instrument **220** or the weight instrument **214** in combination with the moisture and temperature instrument **219** and the header orientation instrument **220**.

As further shown in FIG. **2**A, in one example the receiver and processing node **218** is in communication with the antenna, such as the antenna **110** previously shown in FIG. **1**. Accordingly, any of the crop characteristics measured with one or more of the volume instrument **212**, the weight instrument **214** and the moisture and temperature instrument **219** are associated with the position of the harvester **100** as will be further described herein. Additionally, the cooperation between the antenna **110**, the receiver and processing node **218** and one or more of the instruments described herein are used to accordingly determine one or more harvested crop characteristics and associate those crop characteristics with a particular position within a field. Stated another way, the dynamic yield monitor system **203** dynamically measures the variable crop characteristics, for instance with any of the instruments previously described herein, and associates the according crop characteristics as well as yield values determined with those crop characteristics with the corresponding location on a map, for instance a yield map. By blending this information for instance with the receiver and processing node **218** a dynamic map of one or more harvested crop characteristics as well as yield values corresponding to one or more field locations (and varying at those locations according to the measured characteristics) is accordingly produced.

In another example the dynamic yield monitor system **203** includes a graphical user interface (GUI) **222** configured to allow user input from an operator.

For instance the operator is able to initiate one or more of calibration, diagnostics and review the instrument measurements and variable yield values communicated to and delivered from the receiver and processing node **218**, for instance while the harvester **100** is in a harvesting operation within a field.

Referring again to FIG. **2**A as previously described herein, the dynamic yield monitor system **203** includes a suite of instruments configured to determine each of four variables used in yield calculations. The suite of instruments, for instance the volume instrument **212**, the weight instrument **214** and the moisture and temperature instrument **219**, are provided within the harvester elevator **106** and are accordingly operable to measure the harvested crop in-flow. That is to say, the plurality of instruments are configured to dynamically measure characteristics of a quantity of harvested crop delivered through the harvester elevator **106** at a particular time (e.g., continuously measure the characteristics of the in-flow crop). Accordingly, the instruments **212**, **214**, **219** dynamically measure the various harvested crop characteristics as those characteristics change, for instance as the harvester **100** moves through different areas of the field having varying production (e.g., yield) of a particular harvested crop. That is to say, the suite of instruments including the volume instrument **212**, the weight instrument **214** and the moisture and temperature instrument **219** are able to dynamically measure crop characteristics of an in-flow crop moving through the harvester elevator **106**. Accordingly, as crop characteristics change throughout the field the instruments **212**, **214**, **219** in cooperation with the receiver and processing node **218** are able to measure and log the corresponding crop characteristics. Additionally, the dynamic yield monitor system **203** (e.g., through the receiver and processing node **218**) is accordingly able to generate one or more dynamic variable yield values of the harvested crop according to these dynamically determined crop characteristics.

Referring now to FIG. **2**B, another example of a dynamic yield monitor system **205** is provided. As shown, the dynamic yield monitor system **205** includes a plurality of instruments for instance a volume instrument **212** and a moisture and temperature instrument **219**. Further, the dynamic yield monitor system **205** includes another example of a weight instrument, the weight instrument **224**. In the example shown, the weight instrument **224** is installed for instance within an impact plate in the crop chute **211**. In a similar manner to the weight instrument **214**, the measured weight determined by the weight instrument **224** is communicated with the receiver and processing node **218** in combination with the instrument inputs from the volume instrument **212** and the moisture and temperature instrument **219** to accordingly measure and log a plurality of harvested crop characteristics and generate variable yield values based on those measured crop characteristics. In other regards, the dynamic yield monitor system **205** operates similarly to the dynamic yield monitor system **203** shown in FIG. **2**A. Stated another way, the dynamic yield monitor system **205** is able to receive instrument input from each instrument within the suite of instruments and accordingly generate dynamically varying yield values according to the crop characteristics measured in-flow within the harvester elevator **106**.

As shown in FIGS. **2**A and **2**B, at least some of the instruments of the dynamic yield monitor systems **203**, **205** are positioned within an ascending segment **204** of the harvester elevator **106**. The ascending segment **204** of the harvester elevator **106** is a portion of the harvester elevator **106** consistently filled with the quantity of harvested crop **216**, for instance as it travels from the trough segment **208** to the apex segment **210** where it is delivered through the crop chute **211** to the grain tank **108**. Accordingly, within the ascending segment **204** the volume instrument **212** is in one example housed within the harvester elevator wall. In the example shown for instance in FIG. **2**A the weight instrument **214** is installed on one or more of the paddles **202**. Accordingly, and as further described herein, the weight instrument **214** is substantially static relative to the quantity of harvested crop **216** provided on the respective paddle **202**.

Referring now to FIG. **3**, one example of the volume instrument **212** is provided. As shown in FIG. **3**, the volume instrument **212** in one example includes an optical sensor (e.g., a photo eye, infrared sensor or the like) positioned within a wall of the harvester elevator **106** and directed into the ascending segment **204**. As shown immediately below, a paddle **202**

including a quantity of harvested crop **216** thereon is elevated toward the volume instrument **212**. As further shown with the dashed lines in FIG. **3** a measurement initiating locus **300** and a measurement terminating locus **302** are noted.

As the quantity of harvested crop **216** is elevated through the ascending segment **204** the paddle **202** and the crop thereon will accordingly travel by the volume instrument **212**. As the upper end of the quantity of harvested crop **216** passes by the volume instrument **212** (corresponding to the measurement initiating locus **300**) the volume instrument **212** begins its measurement, is accordingly able to "see" the quantity of harvested crop **216** (e.g., notes darkening within the ascending segment **204**) and communicates with the receiver and processing node **218** or an integrated microcontroller to begin measuring a time period corresponding to the passage of the quantity of the harvested crop **216** and the paddle **202** past the volume instrument **212**. As the measurement terminating locus **302** passes by the volume instrument **212** the instrument correspondingly notes the termination of the measurement (e.g., notes lightening within the ascending segment). Based on the measured period of time between the initiating locus **300** and the terminating locus **302** the receiver and processing node **218** is able, through statistical analysis corresponding to empirically determined characteristics of the harvester elevator **106** and the crop, the volume of the quantity of harvested crop **216**.

Measurements are delivered from the volume instrument **212** to the receiver and processing node **218**, for instance by one or more of a wired connection, wireless connection or the like. In one example the receiver and processing node **218** takes the input volume information (e.g., dark and light detection) and accordingly determines a volume crop characteristic for instance by way of a statistical model based on, as previously described, the characteristics of the crop being harvested as well as the empirically determined characteristics of the harvester elevator **106** (e.g., the area of the paddle **202**, the dimensions of the elevator passage, the speed of the elevator paddle **202** and the like).

Referring now to FIG. **4**, one example of the weight instrument **214** is provided. As previously shown in FIG. **2**A, the weight instrument **214** is in one example installed with one or more of the paddles **202**. One example of such a paddle **202** is provided in FIG. **4**. As shown the weight instrument **214** includes a weight sensor **400** positioned within or adjacent to the paddle **202**. The weight sensor **400** includes, but is not limited to, one or more types of weight sensors such as load cells, strain gauges, piezo elements or the like positioned below a movable plate or incorporated into the surface of the paddle **202**. As further shown in FIG. **4**, the weight instrument **214** in another example includes a microcontroller **402** in communication with the weight sensor **400**. The microcontroller **402** is powered in one example by a power source **404** (e.g., a battery, capacitor charged by the movement of the paddle **202** within the harvester elevator **106**, or the like). As further shown in FIG. **4**, the microcontroller **402** is in one example coupled with a transmitter **406** such as a radio or wireless transmitter. The transmitter **406** facilitates communication between the weight instrument **214** and the receiver and processing node **218**. Accordingly, the moving weight instrument **400** is able to deliver the measured weight of a quantity of the harvested crop **216** to the receiver and processing node **218** even while ascending through the ascending segment **204**.

The weight instrument **214** shown in FIG. **4** determines a static weight of the quantity of harvested crop **216** (in contrast to a dynamic weight where the crop moves relative to the sensor). For instance, as the paddle **202** is ascending through the ascending segment **204** the quantity of harvested crop **216** is static relative to the paddle **202**. Accordingly, any weight determinations made with the weight instrument **214** are not subject to dynamic loading of the instrument by the quantity of harvested crop **216** (for instance as is the case with a harvested crop impacting an impact plate). Instead, the quantity of the harvested crop **216** is statically positioned on the paddle **202** and accordingly the weight sensor **400**, within the ascending segment, conducts one or more weight measurements and thereby accurately measures the weight of the quantity of harvested crop **216** and delivers the measurement to the receiver and processing node **218**.

FIG. **5** shows one example of the receiver and processing node **218** previously shown in FIGS. **2**A and **2**B. As shown, a plurality of inputs are provided to the receiver and processing node **218** including one or more inputs from the suite of sensors previously described herein. In FIG. **5**, the instruments such as the volume instrument **212**, the weight instrument **214**, the moisture and temperature instrument **219** and the head position instrument **220** are shown in communication with the receiver and processing node **218**. As will be described in detail herein, the plurality of inputs (measurements) from the instruments are used by the receiver and processing node **218** to accordingly determine one or more corresponding crop characteristics **500** and variable yield values based on the measured characteristics.

As further shown in FIG. **5** the crop characteristics **500** are input to a filter, such as a blending filter **502** that provides one or more numerical calculations, models and the like configured to use the input harvested crop characteristics **500** to accordingly determine a plurality of variable yield values **504**. In another example, the receiver and processing node **218** further includes an indexing module **506** and a yield map module **508**. As will be described herein, the indexing module **506** is in communication with a position location system for the harvester **100**, such as the antenna **110** previously described herein. Accordingly, one or more of the crop characteristics **500** and the variable yield values **504** are associated with the location of the harvester **100** to accordingly provide indexed locations for each of the determined crop characteristics **500** and variable yield values **504** as they are dynamically determined in-flow crop. In another example the yield map module **508** includes these indexed crop characteristics and variable yield values **500**, **504** and plots these characteristics on a yield map to accordingly generate a yield map including the crop characteristics **500** and the variable yield values **504** plotted thereon.

As previously described, the receiver and processing node **218** is in communication with the suite of instruments previously described and shown in FIGS. **2**A and **2**B. For instance the measurements of the weight instrument **214** are input to the receiver and processing node **218**, for instance into a weight flow module **510**. The weight flow module **510** includes a statistical model generated according to empirical analysis of for instance the harvester elevator **106**, the paddles **202** and other characteristics, such as characteristics of the harvested crop to accordingly use the signal provided by the weight instrument **214** to generate a harvested crop characteristic corresponding to a weight characteristic (e.g., weight per second) that is then input to the blending filter **502**.

In a similar manner, the volume instrument **212** is in communication with a volume flow module **512** of the receiver and processing node **218**. The volume flow module **512** includes a statistical model configured to interpret the signal provided by the volume instrument **212** and accordingly determine a volume crop characteristic (e.g., cubic inches per

second) corresponding to the variable volume of the harvested crop measured as it flows through the harvester elevator **106**.

In another example, the receiver and processing node **218** is in communication with other instruments of the dynamic yield monitor systems **203**, **205** shown in FIGS. **2**A and **2**B. For instance the node **218** is in communication with the moisture and temperature instrument **219** and optionally the head orientation instrument **220**. In the example of the moisture and temperature instrument **219**, the instrument is in communication with a moisture content module **514**. The moisture content module **514** is configured to interpret data provided by the moisture and temperature instrument **219** and accordingly determine a harvested crop moisture (e.g., percent moisture content) as one of the harvested crop characteristics **500**. In another example, the header orientation instrument **220** is in communication with a header module **516** of the receiver and processing node **218**. The header module **516** interprets the signal from the header orientation instrument **220** and accordingly provides an input to the blending filter **502** corresponding to up position or down position of the header **104**.

Accordingly, as shown in FIG. **5** each of the instruments of the suite of instruments **212**, **214**, **219**, **220** generates one or more corresponding harvested crop characteristics **500** that are input to the blending filter **502**. The input harvested crop characteristics **500** are used to generate one or more variable yield values **504**. Optionally, each of the harvested crop characteristics **500** as they are determined (e.g., as the harvester **100** moves through a field and accordingly generates a plurality of each of the crop characteristics) is indexed with the indexing module **506** to the zone corresponding to the particular crop characteristic at a particular time. Accordingly, the dynamic yield monitor system **203** (or **205**) is able on an ongoing basis to associate the varying harvested crop characteristics **500** as they change within the field with the corresponding location (e.g., a zone) within the field from which the in-flow and measured harvested crop was harvested.

Referring again to FIG. **5**, as the harvested crop characteristics **500** are generated on an ongoing basis, for instance as the harvester **100** moves through a field, the blending filter **502** receives the harvested crop characteristics **500** as inputs. The blending filter **502** thereafter blends the harvested crop characteristics **500** by way of one or more yield equations, models and the like to generate corresponding variable yield values **504** that vary according to changes in the harvested crop characteristics **500**. One example of standard yield equation (provided below) uses each measured characteristic (e.g., weight, volume, moisture and temperature) and test weight determined based on these characteristics to generate a yield value.

$$\text{Standard Bushels} = \text{Measured Bushels} \times \frac{100 - \text{Measured \% Moisture}}{100 - \text{Standard \% Moisture}} \times \frac{\text{Test Weight}}{\text{Standard Test Weight}}$$

Measured bushels and test weight are determined according to the measured characteristics (e.g., volume, weight, moisture content and temperature). As described herein, each of these characteristics are dynamically measured on an ongoing continuous based, and are not based on assumptions (e.g., assumptions of test weight). By measuring and determining each of the relevant inputs for yield equations (e.g., volume, weight and optionally moisture content and temperature) accurate and varying yield values **504** are also correspondingly determined on an on-going dynamic basis.

The blending filter **502** is in one example configured to generate one or more variable yield values **504** including but not limited to weight per second, volume per second, density per second (e.g., test weight) and bushels per second of the harvested crop. In a similar manner to the harvested crop characteristics **500** each of the variable yield values **504** as they are generated are optionally indexed for instance by way of the indexing module **506** with a corresponding location of the harvester **100** within the field. Accordingly, the variable yield values **504**, like the harvested crop characteristics **500**, are readily associated with the particular area or zone of the field that provided the harvested crop related to the harvested crop characteristics **500** and the related variable yield values **504**.

The variable yield values **504** (in the same manner as the harvested crop characteristics **500**) are accordingly dynamically determined on an on-going basis as the harvester **100** moves through a field. Each of the harvested crop characteristics **500** in one example are fed through the blending filter **502** to accordingly determine the variable yield values **504**. As the harvested crop characteristics **500** change (e.g., as the harvested crop from varying zones of the field) the corresponding variable yield values **504** also change. The dynamic yield monitor system **203** (or **205**) as shown in FIG. **2**A (or **2**B) is accordingly able to determine the harvested crop characteristics **500** and the variable yield values **504** on an instantaneous and on-going basis and thereby accurately note variation in each of the harvested crop characteristics **500** and the related variable yield values **504** dependent upon the location of the harvester **100** within the field.

As previously described and further shown in FIG. **5**, the yield map module **508** is further in communication with the blending filter **502**. In a similar manner to the association of the harvested crop characteristics **500** with the particular locations with the indexing module **506**, the yield map module **508** communicates with the indexing module **106** for instance by way of the blending filter **502** to associate and generate a yield map including for instance a plurality of zones and the corresponding harvested crop characteristics **500** and variable yield values **504** measured and determined for the particular zones. Accordingly, the yield map module **508** generates a yield map for a particular field including a plurality of zones therein with one or more of the associated harvested crop characteristics **500** and the variable yield values **504** for each of the zones mapped to the various zones on the generated yield map.

Referring again to FIG. **5**, as shown the plurality of instruments such as the volume instrument **212** and the weight instrument **214** as well as the moisture and temperature instrument **219** provide inputs to the receiver and processing node **218**. Accordingly, the blending filter **502** with the corresponding harvested crop characteristics **500** is able to determine a test weight on an ongoing basis without any assumptions being made regarding the test weight of a crop for a field. Accordingly, the dynamic yield monitor system **203** (or **205**) is not constrained by assumed values for one of the variables of a yield equation. An operator is not required to enter an assumed test weight when preparing to harvest within a particular field. Instead, with the ongoing measurements of both weight and volume, for instance with the weight instrument **214** and the volume instrument **212**, a corresponding test weight (one of the variable yield values **504** shown in FIG. **5**) is accordingly determined accurately and instantaneously according to the corresponding dynamically determined har-

vested crop characteristics **500** (e.g., the harvested crop weight and the harvested crop volume.

In another example, the addition of the moisture and temperature instrument **219** provides further information to more accurately determine the test weight variable yield value **504** for use in the determination of other variable yield values (e.g., bushels, weight and volume based yield values and the like). For instance, the harvested crop characteristics **500** including the harvested crop weight, harvested crop volume and the harvested crop moisture content and temperature are fed on an on-going basis to the blending filter **502** and accordingly generate corresponding test weight values that accurately represent the test weight of the harvested crop, for instance the inflow harvested crop as it moves through the harvester elevator **106**, without requiring any static assumption of a test weight made for instance prior to harvesting of the harvester **100** within a field. Stated another way, the test weight yield value (one of the variable yield values **504** shown in FIG. **5**) is generated in an accurate and ongoing dynamic fashion that facilitates more accurate yield values (e.g., bushels per second) when input into a yield equation.

Accordingly, the previous need to assume a test weight is removed and a more accurate determination of yield values provided according to the measurements of harvested crop characteristics of an in-flow crop within the harvester elevator **106**.

FIG. **6** shows one example of a method **600** for dynamically measuring yield, for instance with the dynamic yield monitor systems **203**, **205** previously described herein. In describing the method **600**, reference is made to one or more components, features, functions and steps described herein. Where convenient, reference is made to the components, features, steps and the like with reference numerals. Reference numerals provided are exemplary and are not exclusive. For instance features, components, functions, steps and the like described in the method **600** include, but are not limited to, the corresponding numbered elements provided herein. Other corresponding features described herein (both numbered and unnumbered) as well as their equivalents are also considered.

At **602**, the method **600** includes measuring a plurality of harvested crop characteristics **500** with a suite of yield instruments within a harvester elevator **106**. In one example, the suite of instruments (e.g., one or more instruments) includes a volume instrument **212** and a weight instrument **214**. Optionally, a moisture and temperature instrument **219** and a header orientation instrument **220** are also provided. At **604**, measuring the plurality of harvested crop characteristics includes measuring a harvested crop volume with the volume instrument **212** of a moving flow of the harvested crop (e.g., a quantity of the harvested crop **216**) within the harvester elevator **106**. At **606**, measuring of the harvested crop characteristics further includes measuring a harvested crop weight of the moving flow of the harvested crop within the harvester elevator **106**.

At **608**, the measured plurality of harvested crop characteristics **500** are communicated (e.g., wirelessly) to a receiver and processing node **218**. At **610**, the receiver and processing node **218** determines a variable harvested crop test weight of the moving flow of the harvested crop based on at least the measured harvested crop volume and weight. That is to say, with the harvested crop characteristics **500**, for instance the dynamically changing harvested crop volume and weight (variable as the harvester **100** continues to harvest within a field), the receiver and processing node **218** is configured to use each of these harvested crop characteristics to accurately and dynamically determine a variable yield value **504**, such as the harvested crop test weight. As described herein, the dynamic yield monitor systems **203**, **205** are accordingly configured to determine one or more variables (e.g., the harvested crop characteristics) of yield equations. Optionally, the dynamic yield monitor systems **203**, **205** are configured to determine all of the variables of yield equations (e.g., weight, volume, moisture content and temperature, the test weight related to these variables). Stated another way, the dynamic yield monitor systems **203**, **205** are configured to accurately monitor each of the harvested crop characteristics without reliance on assumed values for one or more of the variables. Further, the dynamic yield monitor systems **203**, **205** are configured to measure each of the harvested crop characteristics dynamically (e.g, as they vary during harvesting) to accordingly accurately represent the characteristic measurements throughout a harvesting operation.

At **612** the method **600** further includes generating one or more variable yield values, such as the variable yield values **504** shown in FIG. **5**. The variable yield values **504** are based on the measurements of the harvested crop characteristics including at least the measured harvested crop volume and weight and the determined variable harvested crop test weight. That is to say, with the variable test weight previously determined at **610** the receiver and processing node **218** is able to generate accurately and on an ongoing basis one or more variable yield values including, but not limited to, the harvested crop weight per unit time, volume per unit time and bushels per unit time determined according to one or more accepted yield equations. Stated another way, with the method **600** each of the plurality of harvested crop characteristics **500** and the corresponding yield values **504** are determined in an ongoing dynamic basis according to measurements of at least the harvested crop volume and harvested crop weight of the in-flow harvested crop as previously described herein. Further, the harvested crop test weight is determined based on both of the harvested crop volume and the harvested crop weight without requiring assumption of a test weight. Accordingly, the variable yield values **504** based, at least in part, on the variable test weight are more accurately determined as the test weight itself is based upon actual measured data corresponding to the harvested crop characteristics of volume and weight determined in an ongoing basis as the harvester **100** operates within a field.

Several options for the method follow. In one example measuring the plurality of harvested crop characteristics **500** includes measuring a harvested crop moisture content and temperature of the moving flow of the harvested crop (e.g., in-flow) within the harvester elevator **106**, for instance with a moisture and temperature instrument **219** as shown in FIGS. **2**A and **2**B. In another example, measuring the harvested crop weight includes measuring the weight of a quantity of the harvested crop **216** while moving the quantity along an ascending segment **204** of the harvester elevator **106**. The quantity of the harvested crop **216** is carried by one or more paddles **202** and the quantity of the harvested crop **216** is static relative to the weight instrument **214** as the weight instrument **214** and the quantity of harvested crop **216** carried thereon ascend together within the ascending segment **204**.

In another example, determining the variable harvested crop test weight includes determining the variable harvested crop test weight based on the measured harvested crop volume, weight, the harvested crop temperature and harvested crop moisture content as each of the plurality of harvested crop characteristics change within a field. As previously stated, as the harvester **100** moves through a field the dynamic yield monitor systems **203**, **205** (FIGS. **2**A and **2**B) are configured to determine each of the harvested crop characteris-

tics **500** in an ongoing and dynamic manner to accordingly determine variable values for each. The yield values, for instance including the determined test weight, are correspondingly determined in an ongoing and dynamic fashion for instance without assumptions regarding the test weight. Instead, the test weight is determined based on the measured harvested crop weight and harvested crop volume (as well as the optional measured moisture and temperature). For instance in one example measuring the harvested crop volume includes measuring a first harvested crop volume corresponding to a first field location (such as a first zone) and measuring a second harvested crop volume corresponding to a second field location (corresponding to a second zone). In a similar manner, measuring the harvested crop weight includes measuring a first harvested crop weight corresponding to a first field location and a second harvested crop weight corresponding to a second field location (e.g., first and second zones). Based on these harvested crop characteristics **500** associated with respective first and second field locations a harvested crop test weight at a first location is determined based on the first harvested crop volume and crop weight and a second harvested crop test weight is determined based on the second harvested crop volume and crop weight. Accordingly, the harvested crop test weight changes according to the corresponding harvested crop characteristics **500** determined for the field location corresponding to both of at least the harvested crop weight and volume.

In another example, generating the one or more variable yield values includes communicating the measured plurality of harvested crop characteristics to the receiver and processing node **218** and generating the one or more variable yield values includes generating one or more variable yield values including, but not limited to, a variable volume value, a variable weight value or a variable test weight value (e.g., density). The variable volume value, variable weight value and the variable test weight value correspond, for instance, to a volume per unit of time, a weight per unit of time and a variable test weight per unit of time (density per unit time) or their instantaneous equivalents at a particular time or times.

In still another example, the method **600** further includes associating one or more of the variable yield values with a plurality of corresponding locations of an agricultural field for instance by way of the indexing module **506** previously shown in FIG. **5**. In another example, the method **600** further includes generating a yield map, for instance based on the associated one or more variable yield values and the corresponding harvested crop characteristics **500** according to their respective positions. For instance, each of the indexed variable yield values **504** and harvested crop characteristics **500** are assigned to their corresponding zones on the yield map by way of a yield map module **508** such as that shown in FIG. **5**.

FIG. **7** is a demonstrative example of a yield map **700**. Optionally, the yield map **700** includes but is not limited to a visual representation of one or more of the harvested crop characteristics **500** previously shown in FIG. **5** and optionally one or more variable yield values **504** also shown in FIG. **5**. A zoomed in portion of the yield map **700** is shown in the right view of FIG. **7**. As shown by way of varying stippling, cross hatching, shading or the like a plurality of zones **702** have corresponding harvested crop characteristics **500** and variable yield values **504**. For instance, as shown in FIG. **7** a plurality of zones **702** having varying crop characteristics and yield values according to actual measured data for instance provided by the suite of yield instruments such as the instruments **212**, **214**, **219**, **220** previously shown in FIG. **5** and further shown in FIGS. **2**A and **2**B are associated with the one or more zones **702**. Accordingly, each of the zones **702** includes in one example an array of information including one or more harvested crop characteristics or one or more corresponding variable yield values **504**.

As further shown, for instance in FIG. **5**, the variable yield values **504** include one or more yield values corresponding to a weight per unit time, a volume per unit time and a density per unit time (e.g., a test weight per unit time). The yield map **700** accordingly provides a representation to the operator of the harvested output (e.g., yield) provided during a harvesting operation. Information provided by the yield map **700** is optionally used to determine better husbandry techniques, planting strategies and the like for the field in the next season. Accordingly, by measuring each of the harvested crop characteristics **500** on an on-going dynamic basis and accordingly dynamically determining one or more variable yield values **504** more accurate and helpful yield maps are generated based on actual measured data (without intervening static assumptions, e.g., test weight assumptions).

Referring again to FIG. **7**, first and second representative zones **704**, **706** are provided. As shown each of the zones **704**, **706** has different stippling, cross hatching, shading or the like associated with one or more of the variable yield values **504** or harvested crop characteristics **500**. Optionally the first and second zones **704**, **706** (or any of the plurality of zones **702**) have varying stippling, shading, cross hatching or coloring techniques, textual indications or values, or any combination thereof to accordingly provide indications (qualitatively or quantitatively) of one or more values (e.g., the harvested crop characteristics **500** or variable yield values **504**). In the example shown in FIG. **7**, the first zone **704** has an associated harvested crop characteristic (HCC_1 **500**) and a variable yield value (VYV_1 **504**). In one example the respective harvested crop characteristic **500** and the variable and yield value **504** correspond to one or more of the corresponding harvested crop characteristics described herein as well as one or more of the variable yield values described herein. In a similar manner, the second zone **706** accordingly includes one or more harvested crop characteristics (HCC_2) **500** and one or more variable yield values (VYV_2) **504**.

Accordingly, as shown in FIG. **7** by way of the stippling, shading, coloring, textual indications or values or the like the harvested crop characteristics **500** and variable yield values **504** are indexed for each of the zones **702** (e.g., associated with each of the corresponding zones). As shown for instance in the first and second zones **704**, **706** the stippling is different between the zones thereby indicating one or more of the characteristics therebetween vary. Optionally, the yield map **700** provides one or more interactive zones **702**. For instance the user is able to zoom in and examine each of the zones **702** to accordingly allow (e.g., through a graphical user interface) interaction with the field map **700** to accordingly determine one or more of the characteristics of one or a plurality of the zones **702** of interest.

Referring now to FIG. **8**, one example of a tabular representation of the plurality of harvested crop characteristics and variable yield values (dynamically varying according to the measured characteristics provided by the dynamic yield monitor systems **203**, **205**) is provided. As shown for instance in the left column of the table a plurality of zones such as zones Z_1-Z_{N+10} is provided. As shown in the array of values one or more of the harvested crop characteristics **500** including for instance volume, weight, moisture content and temperature is provided and associated with each of the zones. Further, one or more variable yield values **504** such as test weight, bushels per second and total bushels is optionally provided in other columns of the table. In the exemplary table

shown in FIG. **8** each of the harvested crop characteristics **500** used for instance in one or more standard yield calculations is provided, including for instance the volume, weight, moisture content and temperature measurements that are measured in the respective zones. Additionally, as described herein the volume and weight (and optionally the moisture content and temperature) are used to determine the test weight. In an example, the test weight (e.g., density) for instance includes the measured volume (e.g., a harvested crop characteristic **500**) from the volume flow module **512** divided by the measured weight (e.g., harvested crop characteristic **500**) from the weight flow module **510**. In another example, the test weight includes the measured volume divided by the measured weight (both measured on an on-going basis as described herein) and further adjusted according to the measured moisture content and temperature (e.g., also crop characteristics **500** measuring on an on-going basis) to more accurately determine the test weight yield value (used in other yield determinations).

As further previously stated herein, the test weight is dynamically determined according to volume and weight measurements and accordingly is not provided according to one or more assumptions. The test weight instead varies with differing measurements of the volume and weight of the harvested crop for instance as the harvester **100** operates within the field for instance the field shown in the yield map **700**. As shown in FIG. **8**, the characteristics and yield values provided therein are accordingly associated with each of the zones. In one example the measured data as well as the determined data such as the variable yield values associated with each of the zones are accordingly then plotted within the yield map **700**.

With either of the yield map **700** of FIG. **7** or the table presented in FIG. **8** the operator of the harvester **100** or other technician is able to receive a graphical or tabular representation of one or more of the harvested crop characteristics **500** and optionally one or more of the variable yield values **504** as they are dynamically measured, for instance with the dynamic yield monitor systems **203**, **205** shown in FIGS. **2**A and **2**B. Further, with the dynamic yield monitor systems **203**, **205** as described herein each of the harvested crop characteristics used with standard yield equations is accordingly determined. Corresponding yield values such as weight per unit time, volume per unit time and total output for instance bushels per unit time or total bushels for a particular zone are thereby accordingly accurately determined without assumptions made for instance regarding test weight.

In one example, the modules such as the indexing module **506** and the yield map module **508** in communication with the blending filter **502** shown in FIG. **5** are configured to generate the graphical representation shown with the yield map **700** of FIG. **7** as well as the tabular representation in FIG. **8**. That is to say, with the indexing module **506** a particular zone is associated with one or more of the harvested crop characteristics and the variable yield values corresponding to the zone in the tabular representation shown in FIG. **8**. The yield map module **508** accordingly interprets the data provided by the indexing module **506** in combination with the blending filter **502** and provides the graphical representation shown with the yield map **700**.

FIG. **9** shows one example of a method **900** for generating a variable crop measurement based yield map such as the yield map **700** shown in FIG. **7**. In describing the method **900** reference is made to one or more components, features, functions and steps described herein. Where convenient reference is made to the components, features, steps and the like with reference numerals. Reference numerals provided are exemplary and are not exclusive. For instance features, components, functions, steps and the like described in the method **900** include but are not limited to the corresponding numbered elements provided herein. Other corresponding features described herein (both numbered and unnumbered) as well as their equivalents are also considered.

At **902**, the method **900** includes measuring a plurality of harvested crop characteristics (e.g., the characteristics **500** shown for instance in FIG. **5**) with a suite of yield instruments. In one example, measuring includes measuring a harvested crop volume at **904** of a moving flow of the harvested crop (e.g., a quantity **216** or a plurality of quantities of the harvested crop). In another example, measurement of the plurality of harvested crop characteristics includes measuring a harvested crop weight of a moving flow of the harvested crop at **906**. In one example the volume of the moving flow of the harvested crop is measured with a volume instrument **212** (e.g., a photo eye or IR sensor) provided within an ascending segment **204** of the dynamic yield monitor system **203** (or **205**). In another example, measuring the harvested crop weight is conducted with a weight instrument **214**, for instance a weight instrument associated with one or more of the paddles **202**. In another example, a weight sensor **224** provided within the crop chute **211** is used to measure the weight of the moving flow of the harvested crop through measurement of the impact on an impact plate in the chute.

At **908** a variable test weight of the moving flow of the harvested crop is determined. As previously described herein, the variable test weight varies according to changes in one or more of the plurality of measured harvested crop characteristics including for instance the measurements of the harvested crop volume and the measurements of the harvested crop weight. Accordingly, assumptions regarding the test weight are thereby avoided. Instead, the harvested crop volume and the harvested crop weight (and optionally the harvested crop moisture content and temperature) are used to dynamically determine the test weight throughout a harvesting operation (e.g., in an on-going fashion that varies based on dynamic measurements of at least the crop volume and weight).

At **910**, the method **900** further includes determining a location of the harvester **100** within a field for instance the field shown in the representative yield map **700** of FIG. **7**. In one example, determining the location of the harvester within the field includes the use of an antenna **110**, for instance in communication with a localized position sensing system local to the field shown in FIG. **7** or a global positioning system (GPS). In one example, the location of the harvester **100** within the field is associated with one or more corresponding zones in the field for instance the zones **702** shown in the views of FIG. **7**.

At **912**, the method **900** further includes generating one or more variable yield values **504** based on the measurements of the harvested crop characteristics **500** and the variable test weight previously determined herein. As shown for instance in FIG. **5**, in one example the receiver and processing node **218** includes a blending filter **502** configured to receive each of the harvested crop characteristics **500** as inputs and accordingly determine one or more of the variable yield values **504** in a dynamic on-going manner according to changing values of the harvested crop characteristics **500**. For instance, as previously described herein variable yield values are determined in one example with one or more standardized equations for determining yield. By providing each of the harvested crop characteristics necessary for the yield equations including for instance weight, volume, moisture and temperature as well as the test weight (based on at least the measured

weight and measured volume) as they dynamically change in the field the corresponding yield values vary dynamically and accurately represent the actual yield throughout the field (and locally at one or more zones **702**).

At **914**, a yield map is generated for the field such as the field shown in FIG. **7** that includes associating one or more of the variable yield values determined at **912** with a corresponding plurality of locations of the field. Stated another way, the variable yield values (and optionally one or more of the harvested crop characteristics **500**) are associated with the zones **702** of the field. For instance, the harvested crop characteristics **500** and the variable yield values **504** are associated with locations determined by way of an indexing module **506** associated with the blending filter **502**. The indexing module **506** in one example uses information provided by the position sensing system (e.g., the antenna **110**) regarding the location of the harvester **100** and accordingly associates the determined location of the harvester **100** with the one or more harvested crop characteristics **500** and the corresponding variable yield values **504**. Accordingly a yield map, such as the yield map **700** shown in FIG. **7**, is generated with the corresponding variable yield values and harvested crop characteristics associated with each of the respective zones **702**.

Several options for the method **900** follow. In one example determining the variable test weight includes determining the variable test weight based on at least the measured harvested crop volume and weight as the plurality of harvested crop characteristics vary in a field, for instance as the harvester **100** moves through the field during a harvesting operation and accordingly harvests crops in differing locations (e.g., differing zones **702**). In one example, measuring the harvested crop volume includes measuring a first harvested crop volume corresponding to a first field location (such as the first zone **704** shown in FIG. **7**) and measuring a second harvested crop volume corresponding to a second field location (such as the second zone **706**). Additionally, the method **900** includes measuring the harvested crop weight such as measuring a first harvested crop weight corresponding to a first field location (the first zone **704**) and measuring a second harvested crop weight corresponding to a second field location (the second zone **706**). In another example determining the variable test weight includes determining a first variable test weight based on the first harvested crop volume and crop weight. for instance associated with the first zone **704**, and determining a second variable test weight based on the second harvested crop volume and crop weight associated with the second zone **706**.

Optionally, generating the one or more variable yield values **504** includes generating one or more of a variable volume value, a variable weight value or a variable test weight value (density), for instance including a measured crop weight or determined dry harvested crop weight as described herein. In one example these values include, but are not limited to, weight per unit time, volume per unit time and density per unit time as well as their instantaneous equivalents. In still another example the method **900** includes sensing a header orientation for instance with the header orientation instrument **220** shown in FIGS. **2**A and **2**B. In one example the indexing module **506** associates the sensed up header orientation or a sensed down header orientation with one or more of the corresponding locations of the field and the one or more harvested crop characteristics **500** or the variable yield values **504**. In one example, with a "down" sensed header orientation the indexing module **506** interrupts association of one or more of the harvested crop characteristics **500** or the variable yield values **504** with the corresponding location of the harvester **500** on the field for instance the field shown in the yield map **700**. In another example, with a sensed "up" header orientation the indexing module **506** permits association of the location of the harvester **100** with the variable yield values **504** (and optionally the harvested crop characteristics **500** as described herein).

In still another example the method **900** includes measuring the harvested crop weight while moving the quantity for instance a quantity of the harvested crop **216** along an ascending segment **204** of a harvester elevator **106**. The quantity of the harvested crop **216** is carried by one or more paddles **202** and the quantity is static relative to a weight instrument such as the weight instrument **214** associated with the paddle **202**. In another example, determining the variable test weight as described herein includes determining the variable test weight based on the measured harvested crop volume, weight and a harvested crop temperature and a harvested crop moisture content, for instance determined with the moisture and temperature instrument **219** shown in FIGS. **2**A and **2**B.

Various Notes & Examples

Example 1 can include subject matter such as dynamic yield monitor system comprising: a suite of yield instruments for measuring a plurality of harvested crop characteristics while a harvested crop is in-flow within a harvester elevator, including: a volume instrument configured for coupling with the harvester elevator, the volume instrument measures a harvested crop volume from the in-flow harvested crop within the harvester elevator, and a weight instrument configured for coupling with the harvester elevator, the weight instrument measures a harvested crop weight from the in-flow harvested crop within the harvester elevator; and a receiver and processing node in communication with the suite of yield instruments, the receiver and processing node configured to determine: a variable harvested crop test weight based on at least the measured harvested crop volume and measured harvested crop weight of the in-flow harvested crop, and a variable yield of the harvested crop based on the measured harvested crop volume, the measured harvested crop weight, and the variable harvested crop test weight.

Example 2 can include, or can optionally be combined with the subject matter of Example 1, to optionally include wherein the volume instrument includes an optical volume instrument configured for coupling along an ascending segment of the harvester elevator.

Example 3 can include, or can optionally be combined with the subject matter of one or any combination of Examples 1 or 2 to optionally include wherein the weight instrument includes a paddle mounted weight instrument configured for coupling with one or more paddles of the harvester elevator.

Example 4 can include, or can optionally be combined with the subject matter of one or any combination of Examples 1 through 3 to optionally include wherein the paddle mounted weight instrument is configured to measure the harvested crop weight along an ascending segment of the harvester elevator, and a quantity of the harvest crop weighed on a paddle is static relative to the weight instrument and moving relative to the remainder of an elevator loop of the harvester elevator.

Example 5 can include, or can optionally be combined with the subject matter of one or any combination of Examples 1-4 to optionally include wherein the weight instrument includes a force impact plate configured for positioning within a crop chute of the harvester elevator.

Example 6 can include, or can optionally be combined with the subject matter of Examples 1-5 to optionally include a moisture and temperature instrument, the moisture and tem-

perature instrument measures a harvested crop moisture and temperature from the in-flow harvested crop within the harvester elevator, and the plurality of harvested crop characteristics include the harvested crop moisture and temperature.

Example 7 can include, or can optionally be combined with the subject matter of Examples 1-6 to optionally include wherein the receiver and processing node includes a blending filter configured to determine the variable harvested crop test weight based on the measured harvested crop volume, weight, temperature and moisture as each of the plurality of harvested crop characteristics vary within a field.

Example 8 can include, or can optionally be combined with the subject matter of Examples 1-7 to optionally include wherein the receiver and processing note incudes a blending filter configured to: receive the measurements of the harvested crop characteristics including the measured harvest crop volume, weight, and a harvested crop temperature and a harvested crop moisture content, and generate one or more variable yield values based on the measurements of the harvested crop characteristics, the one or more variable yield values including one or more of a variable volume value, a variable weight value or a variable test weight value.

Example 9 can include, or can optionally be combined with the subject matter of Examples 1-8 to optionally include wherein the receiver and processing node includes an indexing module in communication with a location sensor, and the receiver and processing node is configured to associate one or more of the variable yield values with a plurality of corresponding locations of an agricultural field.

Example 10 can include, or can optionally be combined with the subject matter of Examples 1-9 to optionally include wherein the receiver and processing node includes a yield map module in communication with the indexing module, and the yield map module is configured to generate a yield map including one or more of the variable yield values associated with the plurality of corresponding locations of the agricultural field.

Example 11 can include, or can optionally be combined with the subject matter of Examples 1-10 to optionally include a method for dynamically measuring yield comprising: measuring a plurality of harvested crop characteristics with a suite of yield instruments within a harvester elevator, measuring including: measuring a harvested crop volume of a moving flow of the harvested crop within the harvester elevator, and measuring a harvested crop weight of the moving flow of the harvested crop within the harvester elevator; and communicating the measured plurality of harvested crop characteristics to a receiver and processing node; determining a variable harvested crop test weight of the moving flow of the harvested crop based on at least the measured harvested crop volume and weight; and generating one or more variable yield values based on the measurements of the harvested crop characteristics including at least the measured harvested crop volume and weight and the determined variable harvested crop test weight.

Example 12 can include, or can optionally be combined with the subject matter of Examples 1-11 to optionally include wherein measuring the harvested crop weight includes: measuring the weight of a quantity of the harvested crop while moving the quantity along an ascending segment of the harvester elevator, the quantity of the harvested crop carried by one or more paddles, and the quantity of the harvested crop is static relative to a weight instrument configured to measure the weight of the quantity.

Example 13 can include, or can optionally be combined with the subject matter of Examples 1-12 to optionally include wherein communicating the measured plurality of harvested crop characteristics includes wirelessly transmitting and receiving one or more of the measured plurality of harvested crop characteristics.

Example 14 can include, or can optionally be combined with the subject matter of Examples 1-13 to optionally include wherein determining the variable harvested crop test weight includes determining the variable harvested crop test weight based on the measured harvested crop volume, weight, a harvested crop temperature and a harvested crop moisture as each of the plurality of harvested crop characteristics change within a field.

Example 15 can include, or can optionally be combined with the subject matter of Examples 1-14 to optionally include wherein: measuring the harvested crop volume includes measuring a first harvested crop volume corresponding to a first field location and measuring a second harvested crop volume corresponding to a second field location, measuring the harvested crop weight includes measuring a first harvested crop weight corresponding to a first field location and measuring a second harvested crop weight corresponding to a second field location, and determining the variable harvested crop test weight includes determining a first harvested crop test weight based on the first harvested crop volume and crop weight and determining a second harvested crop test weight based on the second harvested crop volume and crop weight.

Example 16 can include, or can optionally be combined with the subject matter of Examples 1-15 to optionally include wherein generating the one or more variable yield values includes: communicating the measured plurality of harvested crop characteristics to the receiver and processing node, and generating the one or more variable yield values includes generating the one or more variable yield values including a variable volume value, a variable weight value or a variable test weight value.

Example 17 can include, or can optionally be combined with the subject matter of Examples 1-16 to optionally include associating one or more of the variable yield values with a plurality of corresponding locations of an agricultural field.

Example 18 can include, or can optionally be combined with the subject matter of Examples 1-17 to optionally include generating a yield map including one or more of the variable yield values associated with the plurality of corresponding locations of the agricultural field.

Example 19 can include, or can optionally be combined with the subject matter of Examples 1-18 to optionally include wherein measuring the plurality of harvested crop characteristics includes measuring a harvested crop moisture content and temperature of the moving flow of the harvested crop within the harvester elevator.

Example 20 can include, or can optionally be combined with the subject matter of Examples 1-19 to optionally include a method of generating a variable crop measurement based yield map comprising: measuring a plurality of harvested crop characteristics with a suite of yield instruments, measuring including: measuring a harvested crop volume of a moving flow of the harvested crop, and measuring a harvested crop weight of a moving flow of the harvested crop; and determining a variable test weight of the moving flow of the harvested crop based on the plurality of measured harvested crop characteristics, the variable test weight varying according to changes in one or more of the plurality of measured harvested crop characteristics; determining a location of the harvester within a field; generating one or more variable yield values based on the measurements of the harvested crop characteristics and the variable test weight determined from the

measured harvested crop characteristics; and generating a yield map for the field, generating the yield map including associating one or more of the variable yield values with a plurality of corresponding locations of the field.

Example 21 can include, or can optionally be combined with the subject matter of Examples 1-20 to optionally include wherein measuring the plurality of harvested crop characteristics includes measuring a harvested crop moisture content and temperature of the moving flow of the harvested crop.

Example 22 can include, or can optionally be combined with the subject matter of Examples 1-21 to optionally include wherein determining the variable test weight includes determining the variable test weight based on at least the measured harvested crop volume and weight as the plurality of harvested crop characteristics vary in a field.

Example 23 can include, or can optionally be combined with the subject matter of Examples 1-22 to optionally include wherein: measuring the harvested crop volume includes measuring a first harvested crop volume corresponding to a first field location and measuring a second harvested crop volume corresponding to a second field location, measuring the harvested crop weight includes measuring a first harvested crop weight corresponding to a first field location and measuring a second harvested crop weight corresponding to a second field location, and determining the variable test weight includes determining a first variable test weight based on the first harvested crop volume and crop weight and determining a second variable test weight based on the second harvested crop volume and crop weight.

Example 24 can include, or can optionally be combined with the subject matter of Examples 1-23 to optionally include wherein generating the one or more variable yield values includes generating one or more of a variable volume value, a variable weight value or a variable test weight value.

Example 25 can include, or can optionally be combined with the subject matter of Examples 1-24 to optionally include sensing a header orientation of a harvester, and associating one or more of a sensed up header orientation or a sensed down header orientation with one or more of the corresponding locations of the field or the one or more variable yield values.

Example 26 can include, or can optionally be combined with the subject matter of Examples 1-25 to optionally include wherein measuring the harvested crop weight includes: measuring the weight of a quantity of the harvested crop while moving the quantity along an ascending segment of a harvester elevator, the quantity of the harvested crop carried by one or more paddles, and the quantity of the harvested crop is static relative to a weight instrument associated with the paddle and configured to measure the weight of the quantity.

Example 27 can include, or can optionally be combined with the subject matter of Examples 1-26 to optionally include wherein determining the variable test weight includes determining the variable test weight based on the measured harvested crop volume, weight, and a harvested crop temperature and a harvested crop moisture.

Each of these non-limiting examples can stand on its own, or can be combined in any permutation or combination with any one or more of the other examples.

The above detailed description includes references to the accompanying drawings, which form a part of the detailed description. The drawings show, by way of illustration, specific embodiments in which the invention can be practiced.

These embodiments are also referred to herein as "examples." Such examples can include elements in addition to those shown or described. However, the present inventors also contemplate examples in which only those elements shown or described are provided. Moreover, the present inventors also contemplate examples using any combination or permutation of those elements shown or described (or one or more aspects thereof), either with respect to a particular example (or one or more aspects thereof), or with respect to other examples (or one or more aspects thereof) shown or described herein.

In the event of inconsistent usages between this document and any documents so incorporated by reference, the usage in this document controls.

In this document, the terms "a" or "an" are used, as is common in patent documents, to include one or more than one, independent of any other instances or usages of "at least one" or "one or more." In this document, the term "or" is used to refer to a nonexclusive or, such that "A or B" includes "A but not B," "B but not A," and "A and B," unless otherwise indicated. In this document, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Also, in the following claims, the terms "including" and "comprising" are open-ended, that is, a system, device, article, composition, formulation, or process that includes elements in addition to those listed after such a term in a claim are still deemed to fall within the scope of that claim. Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects.

Method examples described herein can be machine or computer-implemented at least in part. Some examples can include a computer-readable medium or machine-readable medium encoded with instructions operable to configure an electronic device to perform methods as described in the above examples. An implementation of such methods can include code, such as microcode, assembly language code, a higher-level language code, or the like. Such code can include computer readable instructions for performing various methods. The code may form portions of computer program products. Further, in an example, the code can be tangibly stored on one or more volatile, non-transitory, or non-volatile tangible computer-readable media, such as during execution or at other times. Examples of these tangible computer-readable media can include, but are not limited to, hard disks, removable magnetic disks, removable optical disks (e.g., compact disks and digital video disks), magnetic cassettes, memory cards or sticks, random access memories (RAMs), read only memories (ROMs), and the like.

The above description is intended to be illustrative, and not restrictive. For example, the above-described examples (or one or more aspects thereof) may be used in combination with each other. Other embodiments can be used, such as by one of ordinary skill in the art upon reviewing the above description. The Abstract is provided to comply with 37 C.F.R. §1.72(b), to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. Also, in the above Detailed Description, various features may be grouped together to streamline the disclosure. This should not be interpreted as intending that an unclaimed disclosed feature is essential to any claim. Rather, inventive subject matter may lie in less than all features of a particular disclosed embodiment. Thus, the following claims are hereby incorporated into the Detailed Description as examples or embodiments, with each claim standing on its own as a separate embodiment, and it is contemplated that such embodiments can be combined with each other in

various combinations or permutations. The scope of the invention should be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

The claimed invention is:

1. A dynamic yield monitor system comprising:

a suite of yield instruments for measuring a plurality of harvested crop characteristics while a harvested crop is in-flow within a harvester elevator, including:

a volume instrument configured for coupling with the harvester elevator, the volume instrument measures a harvested crop volume from the in-flow harvested crop within the harvester elevator, and

a weight instrument configured for coupling with the harvester elevator, the weight instrument measures a harvested crop weight of the in-flow harvested crop within the harvester elevator, the weight instrument includes a paddle mounted weight instrument configured for coupling with one or more paddles of the harvester elevator and wherein the paddle mounted weight instrument is configured to measure the harvested crop weight along an ascending segment of the harvester elevator, and a quantity of the harvest crop weighed on a paddle is static relative to the weight instrument and moving relative to the remainder of an elevator loop of the harvester elevator; and

a receiver and processing node in communication with the suite of yield instruments, the receiver and processing node configured to determine:

a variable harvested crop test weight based on at least the measured harvested crop volume and measured harvested crop weight of a quantity of the in flow harvested crop within the harvester elevator, and

a variable yield of the harvested crop based on the measured harvested crop volume, the measured harvested crop weight, and the variable harvested crop test weight.

2. The dynamic yield monitor system of claim **1**, wherein the volume instrument includes an optical volume instrument configured for coupling along an ascending segment of the harvester elevator.

3. The dynamic yield monitor system of claim **1**, wherein the weight instrument includes a force impact plate configured for positioning within a crop chute of the harvester elevator.

4. The dynamic yield monitor system of claim **1** comprising a moisture and temperature instrument, the moisture and temperature instrument measures a harvested crop moisture and temperature from the in-flow harvested crop within the harvester elevator, and the plurality of harvested crop characteristics include the harvested crop moisture and temperature.

5. The dynamic yield monitor system of claim **4**, wherein the receiver and processing node includes a blending filter configured to determine the variable harvested crop test weight based on the measured harvested crop volume, weight, temperature and moisture as each of the plurality of harvested crop characteristics vary within a field.

6. The dynamic yield monitor system of claim **1**, wherein the receiver and processing note includes a blending filter configured to:

receive the measurements of the harvested crop characteristics including the measured harvest crop volume, weight, and a harvested crop temperature and a harvested crop moisture content, and

generate one or more variable yield values based on the measurements of the harvested crop characteristics, the one or more variable yield values including one or more of a variable volume value, a variable weight value or a variable test weight value.

7. The dynamic yield monitor system of claim **6** wherein the receiver and processing node includes an indexing module in communication with a location sensor, and the receiver and processing node is configured to associate one or more of the variable yield values with a plurality of corresponding locations of an agricultural field.

8. The dynamic yield monitor system of claim **7**, wherein the receiver and processing node includes a yield map module in communication with the indexing module, and the yield map module is configured to generate a yield map including one or more of the variable yield values associated with the plurality of corresponding locations of the agricultural field.

9. A method for dynamically measuring yield comprising:

measuring a plurality of harvested crop characteristics with a suite of yield instruments within a harvester elevator, measuring including:

measuring a harvested crop volume of a moving flow of the harvested crop within the harvester elevator, and

measuring a harvested crop weight of the moving flow of the harvested crop within the harvester elevator including measuring the weight of a quantity of the harvested crop while moving the quantity along an ascending segment of the harvester elevator, the quantity of the harvested crop carried by one or more paddles, and the quantity of the harvested crop is static relative to a weight instrument configured to measure the weight of the quantity; and

communicating the measured plurality of harvested crop characteristics to a receiver and processing node;

determining a variable harvested crop test weight of the moving flow of the harvested crop based on at least the measured harvested crop volume and weight of a quantity of the moving flow of the harvested crop within the harvester elevator; and

generating one or more variable yield values based on the measurements of the harvested crop characteristics including at least the measured harvested crop volume and weight and the determined variable harvested crop test weight.

10. The method of claim **9**, wherein communicating the measured plurality of harvested crop characteristics includes wirelessly transmitting and receiving one or more of the measured plurality of harvested crop characteristics.

11. The method of claim **9**, wherein determining the variable harvested crop test weight includes determining the variable harvested crop test weight based on the measured harvested crop volume, weight, a harvested crop temperature and a harvested crop moisture as each of the plurality of harvested crop characteristics change within a field.

12. The method of claim **9**, wherein:

measuring the harvested crop volume includes measuring a first harvested crop volume corresponding to a first field location and measuring a second harvested crop volume corresponding to a second field location,

measuring the harvested crop weight includes measuring a first harvested crop weight corresponding to a first field location and measuring a second harvested crop weight corresponding to a second field location, and

determining the variable harvested crop test weight includes determining a first harvested crop test weight based on the first harvested crop volume and crop weight and determining a second harvested crop test weight based on the second harvested crop volume and crop weight.

13. The method of claim 9, wherein generating the one or more variable yield values includes:

communicating the measured plurality of harvested crop characteristics to the receiver and processing node, and

generating the one or more variable yield values includes generating the one or more variable yield values including a variable volume value, a variable weight value or a variable test weight value.

14. The method of claim 13 comprising associating one or more of the variable yield values with a plurality of corresponding locations of an agricultural field.

15. The method of claim 14 comprising generating a yield map including one or more of the variable yield values associated with the plurality of corresponding locations of the agricultural field.

16. The method of claim 9, wherein measuring the plurality of harvested crop characteristics includes measuring a harvested crop moisture content and temperature of the moving flow of the harvested crop within the harvester elevator.

17. A method of generating a variable crop measurement based yield map comprising:

measuring a plurality of harvested crop characteristics with a suite of yield instruments, measuring including:

measuring a harvested crop volume of a moving flow of the harvested crop, and

measuring a harvested crop weight of a moving flow of the harvested crop, measuring the harvested crop weight includes measuring the weight of a quantity of the harvested crop while moving the quantity along an ascending segment of a harvester elevator, the quantity of the harvested crop carried by one or more paddles, and the quantity of the harvested crop is static relative to a weight instrument associated with the paddle and configured to measure the weight of the quantity; and

determining a variable test weight of the moving flow of the harvested crop based on the plurality of measured harvested crop characteristics of a quantity of the moving flow of the harvested crop, the variable test weight varying according to changes in one or more of the plurality of measured harvested crop characteristics;

determining a location of the harvester within a field;

generating one or more variable yield values based on the measurements of the harvested crop characteristics and the variable test weight determined from the measured harvested crop characteristics; and

generating a yield map for the field, generating the yield map including associating one or more of the variable yield values with a plurality of corresponding locations of the field.

18. The method of claim 17, wherein measuring the plurality of harvested crop characteristics includes measuring a harvested crop moisture content and temperature of the moving flow of the harvested crop.

19. The method of claim 17, wherein determining the variable test weight includes determining the variable test weight based on at least the measured harvested crop volume and weight as the plurality of harvested crop characteristics vary in a field.

20. The method of claim 17, wherein:

measuring the harvested crop volume includes measuring a first harvested crop volume corresponding to a first field location and measuring a second harvested crop volume corresponding to a second field location,

measuring the harvested crop weight includes measuring a first harvested crop weight corresponding to a first field location and measuring a second harvested crop weight corresponding to a second field location, and

determining the variable test weight includes determining a first variable test weight based on the first harvested crop volume and crop weight and determining a second variable test weight based on the second harvested crop volume and crop weight.

21. The method of claim 17, wherein generating the one variable yield. values includes generating one or more of a variable volume value, a variable weight value or a variable test weight value.

22. The method of claim 17 comprising sensing a header orientation of a harvester, and associating one or more of a sensed up header orientation or a sensed down header orientation with one or more of the corresponding locations of the field or the one or more variable yield values.

23. The method of claim 17, wherein determining the variable test weight includes determining the variable test weight based on the measured harvested crop volume, weight, and a harvested crop temperature and a harvested crop moisture.

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